

# Fruit and Vegetable Consumption Patterns and Preferences of Students in a Ghanaian Polytechnic

Kpodo F. M. \*, Mensah C., Dzah C.S.

Department of Hospitality and Tourism Management, Ho Polytechnic, Ho, Ghana

\*Corresponding author: fideliskpodo@yahoo.com

**Abstract** Fruits and Vegetables (FVs) consumption is a critical route to long life and good health. Although the consumption of fruit and vegetable is strongly associated with lower risk of cardiovascular diseases, hypertension, diabetes, gastrointestinal diseases and obesity, consumption levels among school-aged children and adults are notably lower than the recommended amount of 400g per day, a quantity approximately equivalent to 5 servings per day. This research therefore evaluated the consumption and preference patterns of FVs among tertiary students in Ho Polytechnic, Ghana. A cross-sectional quantitative design was used to conveniently sample 449 students across the four faculties of the institution who provided data for the study via the completion of a structured questionnaire. Results of the study indicated that majority of respondents surveyed did not consume fruits 1-3 times a day contrary to a regular consumption of vegetables 1 – 3 times a day. Frequently consumed fruits were banana, orange and watermelon whereas frequently consumed vegetables were tomatoes and onion because most respondents used these vegetables in stews. Male students indicated statistically significant higher preference for orange, banana and pineapple while female students significantly preferred blackberries and grapes fruits and the vegetables okra, green pepper and lettuce. Age of respondents influenced consumption of vegetables rather than fruits.

**Keywords:** *fruits, vegetables, polytechnic students, consumption patterns*

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## 1. Introduction

Consumption of fruits and vegetables (FVs) is a critical route to good health and longevity because FVs are rich sources of vitamins, minerals, dietary fibre and phytochemicals. High fruit and vegetable consumption prevents several non-communicable and chronic diseases such as cardiovascular diseases, hypertension, diabetes, gastrointestinal diseases and obesity [1,2]. Due to the high antioxidant content of fruit and vegetables, numerous studies have also revealed a strong link between their consumption and the prevention of colon and prostate cancers [3]. Despite these positive benefits attributed to high intake of fruits and vegetables, the World Health Organization [WHO] estimates that approximately 1.7 million (2.8%) deaths per annum worldwide are linked to inadequate intake of fruits and vegetables [4,5]. The WHO subsequently ranks low fruits and vegetable consumption as the sixth main risk factor for mortality in the world [6]. This risk factor has been noted to be almost as deadly as tobacco use or unsafe sex.

Most researchers recommend that young adults consume at least 400g of FVs a day, a quantity approximately equivalent to 5 servings per day [7]. Several countries have thus adapted the recommendation and initiated the ‘5 a day’ campaign to encourage the consumption of fruits and vegetables [7]. However irrespective of interventions adopted to improve the intake

of FVs, consumption levels among school-aged children and adults are notably lower than the recommended amount of 400g per day [8,9]. Numerous factors influence the consumption of fruits and vegetables and this include socio-economic and socio-cultural factors, food costs, taste, convenience, storage life, accessibility and availability [9]. Fruit and vegetable consumption in developing countries such as Ghana have been rated as very low [10]. However, most studies on fruits and vegetable consumption in Ghana have concentrated on pesticide residue and pathogen contamination [11,12] with less attention on the subject relating to tertiary students. Consequently, little is known about the extent to which Ghanaian tertiary students consume fruits and vegetables. This study therefore sought to investigate fruit and vegetable consumption patterns and preferences among Ho Polytechnic students. Such a study is significant because it makes useful empirical contribution to fruits and vegetable consumption literature in the country. Furthermore, findings of the study will have practical implication relating to the formulation of policies and programs to boost the consumption of fruits and vegetables among students in the country.

## 2. Material and Methods

The target for the study constituted all students of a small three-year higher national diploma awarding

polytechnic in Ghana (an estimated student population of 4000). In order to investigate the fruit and vegetable consumption habits of the students, a cross-sectional quantitative design was deemed appropriate given that the study sought to only describe and quantify the frequency of fruit and vegetable consumption among the students and ascertain the influence of demographic variables on the fruit and vegetable consumption and preference dynamics of the respondents. As an exploratory study, a convenience sample of 449 students was selected across the four faculties of the institution. Colleague lecturers in the various faculties assisted in the data collection process where students at lectures and willing to participate in the study were issued with questionnaires to self-complete. Students were informed of their voluntary participation and assured of confidentiality and anonymity. The survey was conducted in August, 2014.

The questionnaire used to collect data for the study was designed after extensive review of fruit and vegetable consumption literature [13-18]. The instrument was divided into three sections. Demographic profile of the respondents was solicited in the first section. In the second section, frequency of fruit and vegetable consumption was measured requesting the respondents to indicate how often they consumed fruit and vegetables (occasionally, once a week, 2-5 times a week, once a day and 2-3 times a day). In order to assess their fruit and vegetable consumption behaviour, the participants were asked to indicate from a list of a number of different fruits and vegetables (apples, pears, oranges, bananas, pineapples, tomatoes, carrots, lettuce, cabbage etc.) they consumed frequently. Other questions in the section dealt with determinants of choice of fruits and vegetables, quantities usually bought as well as reasons for fruit and vegetable consumption. The last section of the questionnaire measured respondents' preferences for fruits and vegetables on a four-point scale ranging from *like very much* to *dislike very much*.

Analyses were conducted using the Statistical Package for Social Sciences (SPSS version 22.0, Chicago, IL, USA). Descriptive statistics such as frequencies and means were used to summarize the variables relating to respondents' demographic profile, frequency of fruit and vegetable consumption, preferences of respondents, among others. Chi-Square test of independence was used to explore gender and age differences in frequency of fruit and vegetable consumption. Furthermore, the main effect of age on frequency of fruit and vegetable consumption was analyzed using the Kruskal-Wallis test.

### 3. Results

#### 3.1. Demographic Profile of Respondents

The sample consisted of the 449 polytechnic students of which the female respondents (51.0%) marginally outnumbered their male (49.0%) counterparts. Most (70.2%) of the respondents were in the age bracket of 21 and 29 while those aged between 30 and 39 constituted 18.3 percent of the sample with another 10.9 percent aged 20 or less. A greater proportion (91.4%) of the sample was unmarried with only 7.7 percent being married with a minority indicating widowed (0.4%) and separated (0.4%).

Almost half (45%) of sample was represented by business and management students followed by those pursuing engineering (23.8%) and applied sciences (22.7%) programmes whereas art and design students were in the minority (7.9%).

#### 3.2. Frequency of Vegetables and Fruits Consumption

More than half (59.3%) of the respondents took vegetables at least three times a day while 30% did so one to 5 times in a week with about 10.7% admitting being occasional consumers of vegetables. Concerning fruit consumption, about 36.6% of the respondents ate fruits between 1 and 5 times weekly however, one-third intimated consuming fruits between 1 and 3 times daily with a considerable proportion (31.9%) doing so occasionally.

#### 3.3. Frequently Consumed Fruits and Vegetables

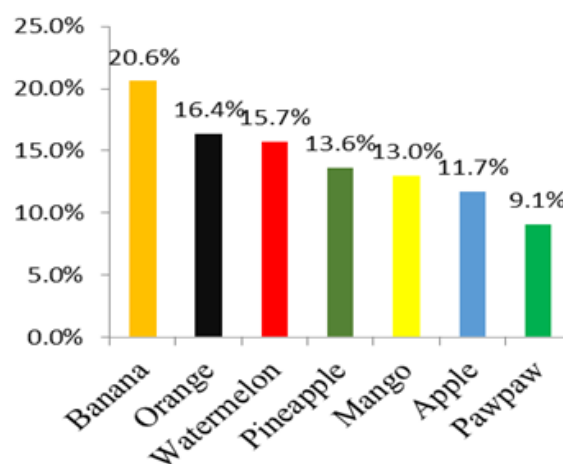


Figure 1. Commonly consumed fruits

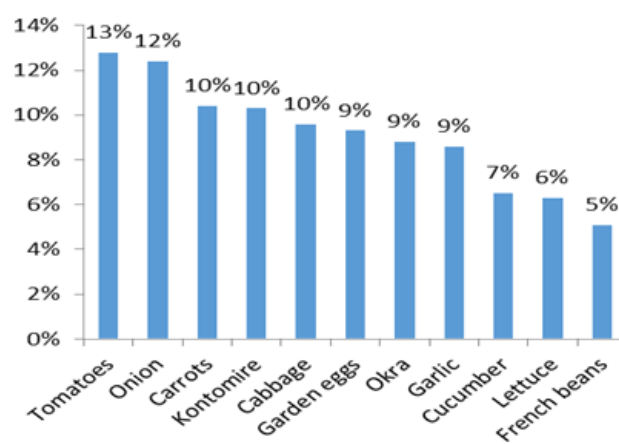


Figure 2. Commonly consumed vegetables

To facilitate a change in behaviour for improving the consumption of fruits and vegetables, there was the need to investigate consumer preference for specific fruits and vegetables so as to design social marketing interventions which will encourage consumption. Banana (*Musa acuminata*) (20.6%) was the most frequently consumed fruit followed by orange (*Citrus sinensis*) (16.4%) and watermelon (*Citrullus lanatus*) (15.7%). In descending

order, apple (*Malus domestica*) (11.7%) and pawpaw (*Carica papaya*) (9.1%) were least patronised by the respondents (Figure 1). Regarding the vegetables commonly patronised by the respondents, tomatoes (*Lycopersicon esculentum*) (12.8%) and onions (*Allium cepa*) (12.4%) appeared to be marginally the top two commonly patronised vegetables. However, in descending order, cucumber (*Cucumis sativus*), lettuce (*Lactuca sativa*) and French beans (*Phaseolus vulgaris*) were least patronised by the respondents (Figure 1 and Figure 2).

### 3.4. Forms of Consuming Fruits and Vegetables

By far, a greater proportion (51.5%) of the respondents ate vegetables when used in preparing stew whereas 19.7% consumed vegetables in salad form but few (10.3%) respondents ate vegetables as a side meal. In the case of

fruits, respondents will usually take fruits as and when they felt like doing so (36.9%), while a sizable proportion of the respondents took fruits as dessert (31.0%) however only a minority ate fruits as snack (12.7%), as part of a main meal (12.0%) and a main meal (7.3%).

### 3.5. Factors that Influence the Choice of Fruits and Vegetables

As found in previous studies, respondents' choice of fruits to eat is predominantly influenced by availability followed by convenience and attractiveness (Table 1). Long storage life and cost appeared to be the least important determinants of consumption of fruits (Table 1). When choosing fruits to buy and eat, respondents were influenced much by availability followed by convenience and attractiveness of the fruit. Long storage life was considered least important in the selection of fruits to eat.

Table 1. Factors that Influence Respondents' Choice of Fruits and Vegetables

Factor	Fruits (N=676)			Vegetables (N = 706)		
	N	%(responses)	%(respondents)	N	%(responses)	%(respondents)
Availability	229	36.5	52.0	193	27.3	43.8
Convenience	131	20.9	29.8	140	19.8	31.7
Attractiveness	101	16.1	23.0	75	10.6	17.0
Cost	86	13.7	19.5	96	13.6	21.8
Long storage life	80	12.8	18.2	77	10.9	17.5
Storage facility	-	-	-	85	12.0	19.3
No particular reason	-	-	-	40	5.7	9.1
<b>Total</b>	<b>627</b>	<b>100.0</b>	<b>142.5</b>	<b>706</b>	<b>100</b>	<b>160.2</b>

Multiple response set.

It is interesting to note that cost was not a critical determinant in the choice of fruits to consume. Concerning vegetables, just like fruits, availability was considered the foremost factor in the choice of vegetables to eat followed by convenience and cost. However, long storage life and attractiveness were less critical.

### 3.6. Quantities of Fruits and Vegetables Usually Purchased

Most (45.8%) of the respondents will buy vegetables that will be enough for one serving while another 28.3 percent buys enough to eat throughout the day. About 19.7 percent of the respondents said they buy vegetables that will last for some few days whereas a minority will buy vegetables that last for a week or more. Similar patterns observed in vegetables buying behaviours are reported for buying of fruits as well. Most (38.6%) of the respondents would buy fruits that will just be adequate for one serving while others (25.3%) will buy the quantity that they will use for some few days. Only a few of the respondents (17.7%) will buy vegetables for use for a week or more.

### 3.7. Reasons for Consuming Fruits and Vegetables

The respondents commonly consumed fruits because of the known health benefits (58.7%) and for taste (19.3%). A few (10.9%) said they consumed fruits in order to satisfy hunger while others were motivated by the unknown health benefits (6.4%) while a minority (4.7%)

had no specific reason for the consumption of fruits. Similarly, in the case of vegetables, most respondents were motivated to consume vegetables because of known benefits (56.4%) followed by taste (17.9%) and satisfaction of hunger (13.5%). As regards reasons for consuming vegetables among the polytechnic students most of them (56.4%) consumed vegetables due to known health benefits while 17.9% for taste, 13.5% to satisfy hunger, 7.5% unknown health benefits and 4.8% for no specific reason.

### 3.8. Places for Buying Fruits and Vegetables

Respondents were requested to indicate the places they usually buy fruits and vegetables. The market (53.7%) was the most popular place for buying of fruits and vegetables whereas the supermarket (23.1%) and roadside (23.1%) were equally patronised by the respondents but hawkers (10.9%) farms (4.9%) were least utilised.

### 3.9. Fruit and Vegetable Preferences

Respondents' preference for banana, apple and watermelon were very high relative to other fruits (Table 2). However, in descending order, guava (*Psidium guajava*) (M=3.24), blackberries (*Rubus fruticosus*) (M=3.03) and lemon (*Rubus fruticosus*) (M=2.58) were the least liked fruits. Concerning preference for vegetables, the top three most liked vegetables were carrots (*Daucus carota*), tomato and onion (Table 2). However, respondents, in descending order, had least preference for cucumber

(M=3.27), bokoboko (*Talinum triangulare*) (M=2.41) and aleefu (*Amaranth cruentus*) (M=2.26).

**Table 2. Fruit and Vegetable Preferences of Respondents**

Fruit	Mean(SD)	Vegetable	Mean (SD)
Apple	3.65(0.629)	Tomato	3.77(0.514)
Watermelon	3.60(0.731)	Onion	3.75(0.580)
Pear	3.57(0.745)	Cabbage	3.59(0.687)
Pineapple	3.50(0.757)	Green pepper	3.54(0.682)
Orange	3.47(0.713)	Kontomire	3.48(0.834)
Mango	3.47(0.821)	Lettuce	3.43(0.737)
Grapes	3.42(0.796)	Okro	3.36(0.796)
Pawpaw	3.40(0.790)	Pepper	3.36(0.804)
Tangerine	3.27(0.833)	Garden eggs	3.35(0.822)
Guava	3.24(0.822)	Cucumber	3.27(0.861)
Blackberries	3.03(0.899)	Bokoboko	2.41(1.033)
Lemon	2.58(0.959)	Aleefu	2.26(1.084)

Scale: Liked very much=4 to Disliked very much=1.

### 3.10. Gender and Fruits Preferences

Mann Whitney U tests were conducted to explore gender differences in fruit and vegetable preferences of the respondents. Based on the results, male students indicated statistically significant higher preference for orange, banana and pineapple than their female counterparts (Table 3). However, in the case of blackberries and grapes, the female respondents indicated a statistically significant likeness than the male respondents. Regarding differences in preference for vegetables, more females than males were likely to indicate preference for okra than males (Table). In the same direction, females indicated higher preference for cucumber, green pepper and lettuce than their male counterparts did.

**Table 3. Gender Difference in Like and Dislike for Fruits**

Fruit	Gender		U	Z	P-value
	Median score				
	Male	Female			
Orange	<b>3.62</b>	3.45	21496	-3.06	<b>.002</b>
Banana	<b>3.82</b>	3.72	22592	-2.29	<b>.022</b>
Pineapple	<b>3.67</b>	3.51	21716	-2.78	<b>.005</b>
Watermelon	3.66	<b>3.71</b>	23710	-.96	.337
Apple	3.69	<b>3.71</b>	23997	-.48	.629
Pawpaw	3.51	3.48	24022	-.59	.553
Mango	3.58	3.59	24443	-.06	.946
Lemon	2.66	2.51	22584	-1.26	.208
Tangerine	3.35	3.39	23878	-.52	.601
Blackberries	3.02	<b>3.25</b>	20479	-2.50	<b>.012</b>
Pear	3.65	3.68	23636	-.50	.614
Guava	3.29	3.39	22803	-1.21	.223
Grapes	3.37	<b>3.65</b>	19444	-4.19	<b>.000</b>

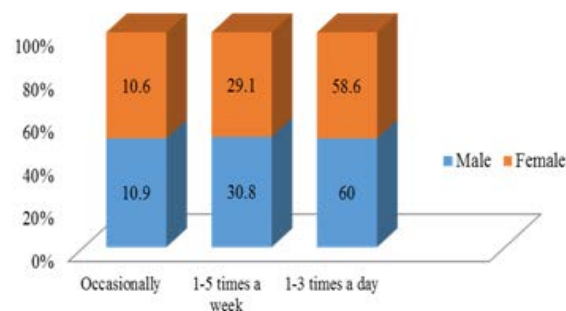
Scale: Liked very much=4 to Disliked very much=1.

**Table 4. Gender Differences in Likeness and Dislike for Vegetables**

Fruit	Gender		U	Z	P-value
	Median score				
	Male	Female			
Onion	3.77	3.83	23657	-1.51	.129
Tomato	3.78	3.82	24166	-.85	.395
Pepper	3.46	3.45	23864	-.18	.857
Garden eggs	3.44	3.47	24360	-.48	.625
Okra	3.33	<b>3.57</b>	20038	-3.69	<b>.000</b>
Cabbage	3.65	3.67	24115	-.47	.638
Cucumber	3.30	<b>3.48</b>	20797	-2.45	<b>.014</b>
Green pepper	3.51	<b>3.68</b>	20970	-3.17	<b>.002</b>
Carrots	3.75	3.83	22637	-1.88	.060
Lettuce	3.40	<b>3.60</b>	19859	-3.40	<b>.001</b>
Kontomire	3.62	3.58	24257	-.52	.603
Bokoboko	2.44	2.38	22334	-.44	.658
Aleefu	2.20	2.15	22278	-.13	.894

### 3.11. Gender and Vegetable Consumption

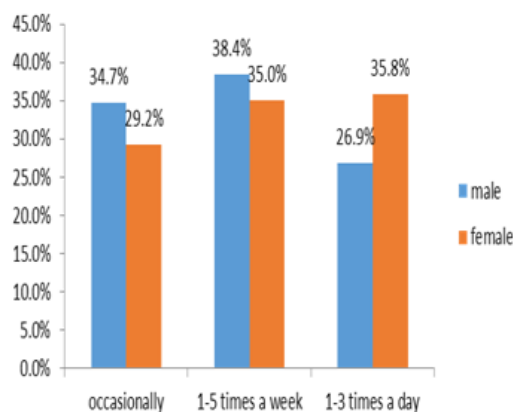
Chi-Square tests were conducted to explore gender differences in the frequency of fruits and vegetable consumption. As depicted in Figure 3, against expectation, the reported difference in the consumption of vegetables between male and female students was found to be statistically insignificant ( $\chi^2(2, n=449) = 1.16, p > 0.05$ ).



**Figure 3. Gender and frequency of vegetable consumption**

### 3.12. Gender and Fruit Consumption

Regarding gender differences in the consumption of fruits, slight differences were observed between females and males (Figure 4) however, the variations were not statistically significant ( $\chi^2(2, n=449) = 4.20, p > 0.05$ ).



**Figure 4. Gender and frequency of fruit consumption**

### 3.13. Age and Fruit Consumption

Results of a Chi-Square test of independence conducted to explore the association between age and frequency of fruit consumption (Figure 5) showed a statistically insignificant difference in the self-reported frequency of fruit consumption among the three cohorts ( $\chi^2(4, n=445) = 2.70, p > 0.05$ ).

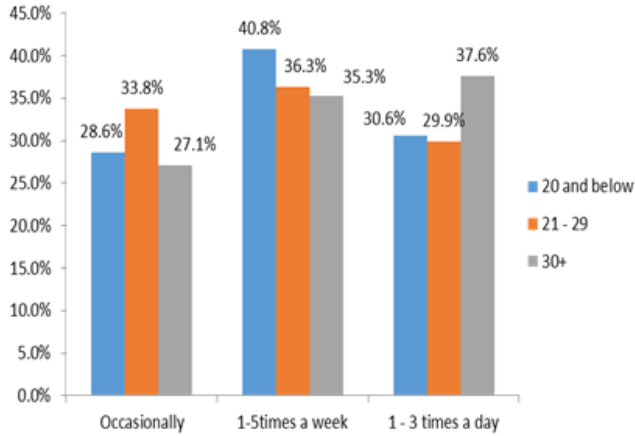


Figure 5. Age and frequency of fruit consumption

### 3.14. Age and Vegetable Consumption

Initial Chi-Square test results (Figure 6) aimed at exploring relationships between vegetable consumption and age indicated a statistically significant difference in self-reported frequency of vegetable consumption ( $\chi^2(4, n=447) = 14.25, p < 0.05$ ). However, pairwise comparison tests conducted to find out which age groups are different from each other using Kruskal Wallis revealed statistically insignificant difference in the reported vegetable consumption among the age groups (Figure 7).

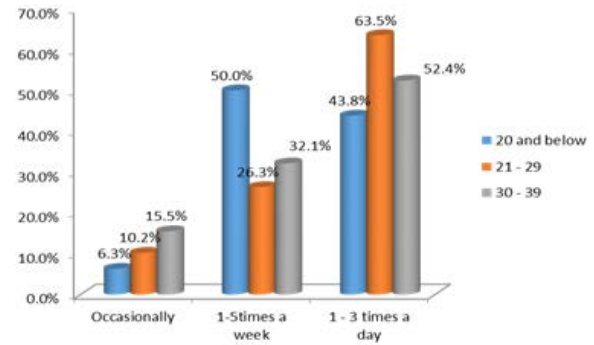


Figure 6. Age and frequency of vegetable consumption

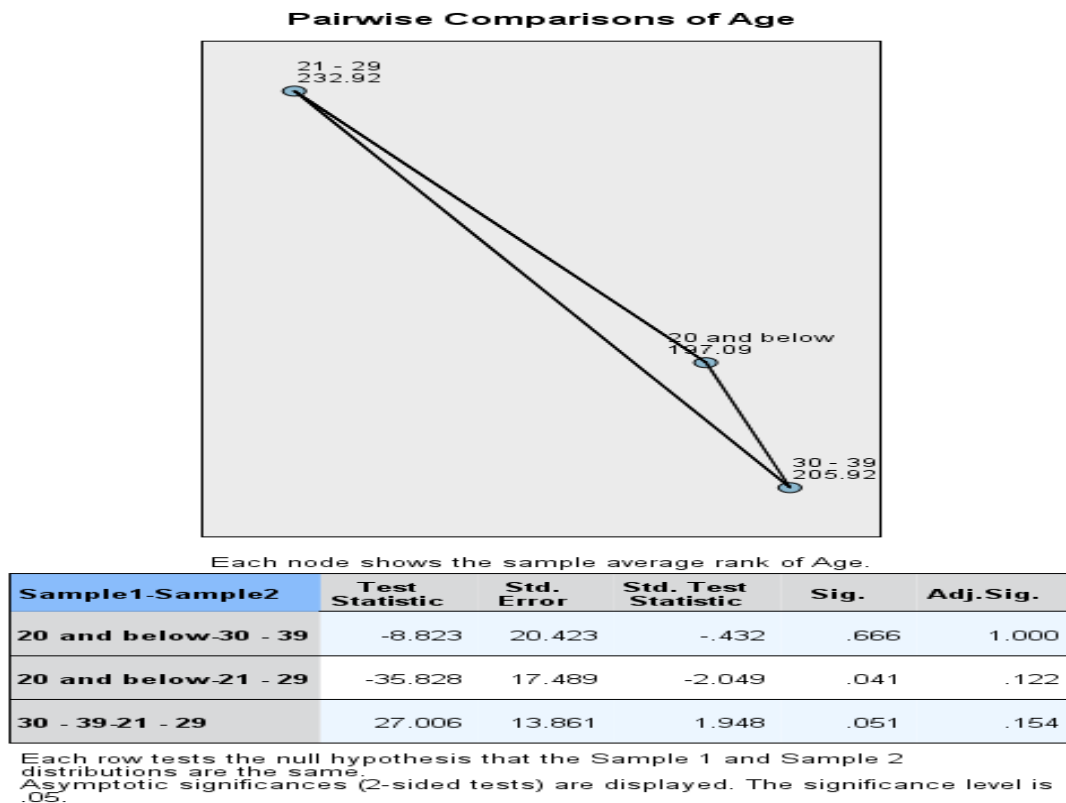


Figure 7. Pairwise comparison of vegetable consumption among age groups of respondents

## 4. Discussion

College students have been noted to be aged between 18 to 24 years and at this age since parental supervision is less they are more likely to develop food patterns that have the potential to influence their future [19]. As anticipated, most of the respondents were in the age bracket of 21 and 29. Researchers have recommended at least 2 daily serving of fruits and 3 daily servings of

vegetables with at least one serving of vegetables involving a dark green and leafy vegetable [20]. The findings for fruit consumption rates however were lower and comparable with several studies which have shown that tertiary students engage in numerous unhealthy food eating habits with 66% and 95% eating less than the recommended fruit and vegetable daily servings [18,21,22,23]. However results were contrary to de Bruijn [2] who reported 68.5% consumption rate among Dutch college students who eat at least two pieces of fruit per

day. Banana, orange and pawpaw were the frequently consumed and fruits possibly because these fruits were available to the students, whereas tomatoes and onion which are the vegetables predominantly and commonly used in the preparation of stews were the most consumed vegetables. Nago et al. [24] reported no or limited availability of fruits and vegetables on school campuses as a factor that inhibits intake. Hence to encourage the consumption of fruits and vegetables, the school's role alongside nutritional education is also to make fruits and vegetables readily available and easily accessible to students. Gender differences have been reported for the consumption of fruits and vegetables [25]. Females are observed to show more favourable attitudes and greater perceived behaviour control regarding fruit and vegetable consumption than males [26]. In the current study although slight differences were observed between females and males the variations were not statistically significant. However in terms of likeness for specific fruits and vegetable statistically significant differences were recorded. The female respondents indicated significant preference for okra, cucumber, green pepper, lettuce, blackberries and grapes whereas the male counterparts significantly preferred orange, banana and pineapple fruits. Purchases and subsequent consumption of fruits and vegetables have been known to be influenced by age [26]. Most researchers have noted that fruit and vegetable consumption positively correlates with increasing age due to an increase in nutritional knowledge. Although the study established a statistically significant difference in the relationship between age and vegetable consumption, age of respondents did not influence fruit consumption.

## 5. Conclusion

Majority of respondents surveyed did not consume fruits 1 – 3 times a day however consumed vegetables 1 – 3 times a day. Frequently consumed fruits were banana, orange and watermelon. Most respondents consume fruits because they 'feel like eating fruits'. Frequently consumed vegetables were tomatoes and onions. Most respondents used vegetables in stews. Male students indicated statistically significant higher preference for orange, banana and pineapple whereas female students indicated statistically significant likeness for blackberries and grapes. Female students indicated statistically significant higher preference for okra, green pepper and lettuce than their male counterparts. To facilitate a change in behaviour for improving the consumption of fruits and vegetables among Ghanaian students, social marketing strategies should be directed at making highly preferred and frequently consumed fruits and vegetables readily available and easily accessible to students.

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